Group 10

Group Members:
Steve Ritchie
Jeffrey Tang
Thanh Nguyen

Topic:

We have narrowed our focus to hand gesture recognition - specifically, recognizing finer, more subtle gestures, such as symbols from the sign language alphabet.

Week 2 Progress:

This week involved a lot of experimentation. Our original objective for this week was to use hand structure recognition/analysis to identify finger positions. However, we discovered early on that this would not significantly advance our final goal of recognizing the sign language alphabet. We then shifted our focus to developing a framework around the idea of using dense optical flow to recognize gestures.

This involved efforts on a few fronts:

1. Refining our hand detection / bounding techniques in order to more robustly handle scale differences in the future. To that end, we experimented with various tunable parameters, as well as various combinations of blurring, normalization, thresholding, skin detection, background detection, etc. One discovery which may prove helpful in the future is that skin detection appears to work better on a dark background than on the light backgrounds in our original training videos.

2. Creating a suitable training set of videos covering a small number of sign language gestures. As mentioned above, the light background we originally used may be more difficult to work with than anticipated; we will take this into account when creating more training videos. We may also try shooting videos which are more amenable to background subtraction.

3. Writing code to calculate dense optical flow for videos. Our code is currently able to extract dense optical flow from frame to frame, extract and sum the magnitude of vectors over the entire video sample, and compare the summed vectors to determine likely matches, though there is much, much more work to be done.

Week 2 Demos:

1. To view optical flows extracted from a series of training videos:

   ```
   python tracking_hand.py
   ```

2. To view energy images extracted from training videos / proof of concept recognition:

```
python tracking_hand.py
```

Weeks 3 & 4 Outlook (11/21 - 12/02):

There is much still to be done:

1. Expand our set of training and test videos to get a corpus of reasonable size/diversity

2. Figure out how to robustly recognize energy images from different video samples. We have already experimented with simple differencing, but it looks like better methods (perhaps a Haar classifier) will be needed. We hope to also see improvements by developing ways to compensate for translations and scale changes.

3. Clean up our code and write a suitable unit test suite.

4. Write up a final report and create demo material for the in-class presentation.

Realistically we are not sure how much progress can really be made in the next two weeks from an implementation perspective; we will have to wait and see if our experimentation pans out. Group work is already difficult to coordinate, and with the Thanksgiving holidays approaching (as well as projects and exams in other classes), it's not clear how much time we can really spend working together on this. Furthermore, at some point implementation will have to be abandoned in favor of administrative tasks like report writing and presentation practice.